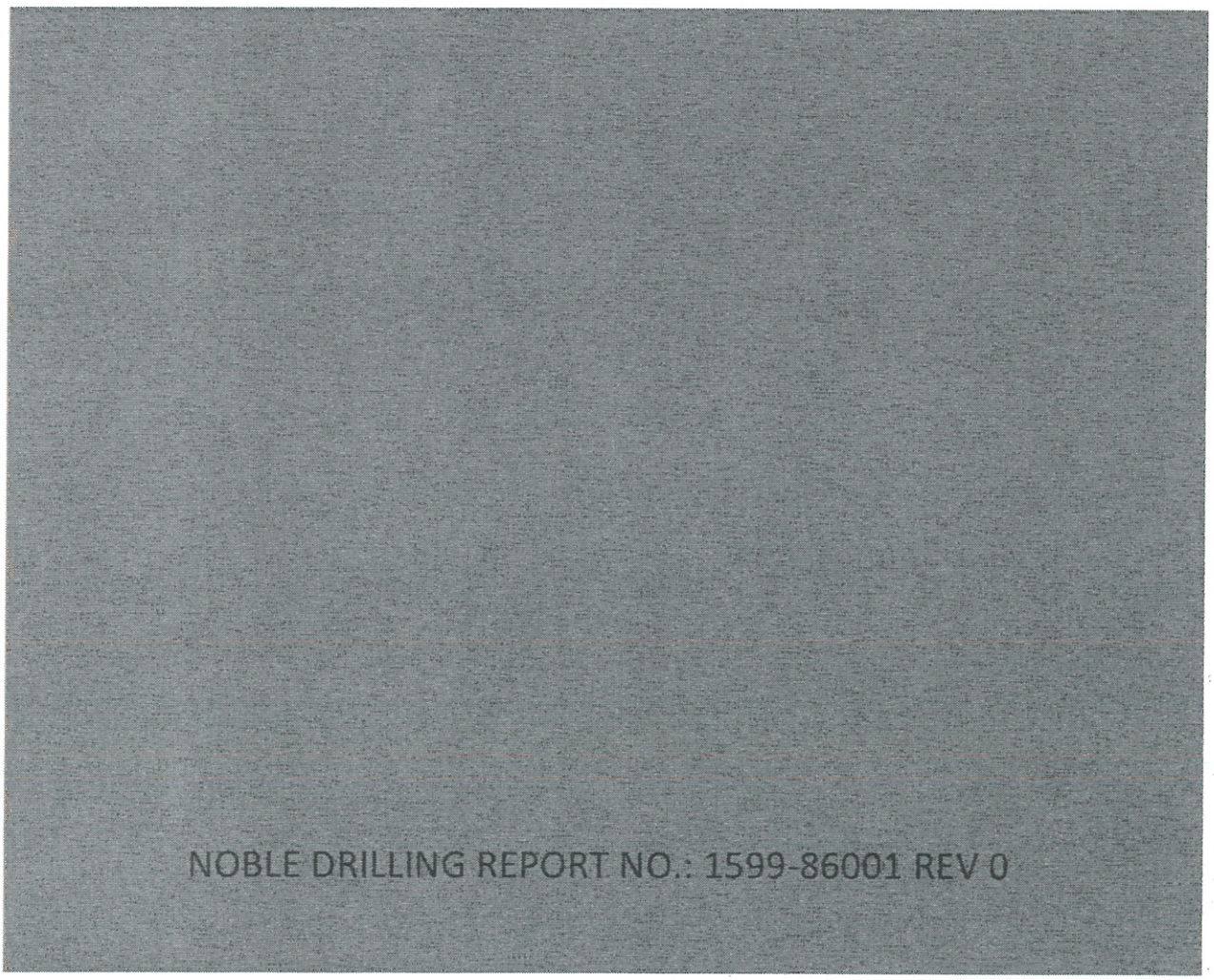
NOBLE DISCOVERER

DRAIN SYSTEM COLLECTION AND PROCESSING DESCRIPTION OF OPERATION



VESSEL: Noble Discoverer
LOCATION OF OPERATION: Chukchi Sea OCS, Alaska

The **Noble Discoverer** Drain System has been redesigned to provide full compliance with NPDES & VGP Permits. NPDES Permit No. AKG-28-8100 considers this system as a Number 002 Discharge (Deck Drainage Discharge). Please refer to the NPDES documentation for details related to processing and testing requirements of discharges.

ACRONYM DEFINITIONS

MEPC Marine Environment Protection Committee
[redacted]
NPDES National Pollutant Discharge Elimination System
OCM Oil Content Monitor/Oil Content Meter
OEM Original Equipment Manufacturer
OWS Oily Water Separator

SYSTEM DESCRIPTION

The System will collect all fluids and precipitation spilling onto the "weather area" decks and platforms. There are approximately 14 deck drains located along the Port and Starboardsides of the Vessel. [redacted]

Drill floor drainage will be processed separately from the deck drains, and are routed directly to the [redacted] Drill floor drains all combine into a single header which is routed through the [redacted] for processing and discharge as described in section "DRILL FLOOR DRAIN FLUID HANDLING" below. Although the system is principally intended to be operated manually to comply with the sampling requirements of the NPDES Permit, the system can automate the process of determining whether fluid is clean or contaminated. The automated process combined with additional sheen and other testing will help optimize system performance, and reduce human factors. Protection of the environment is paramount.

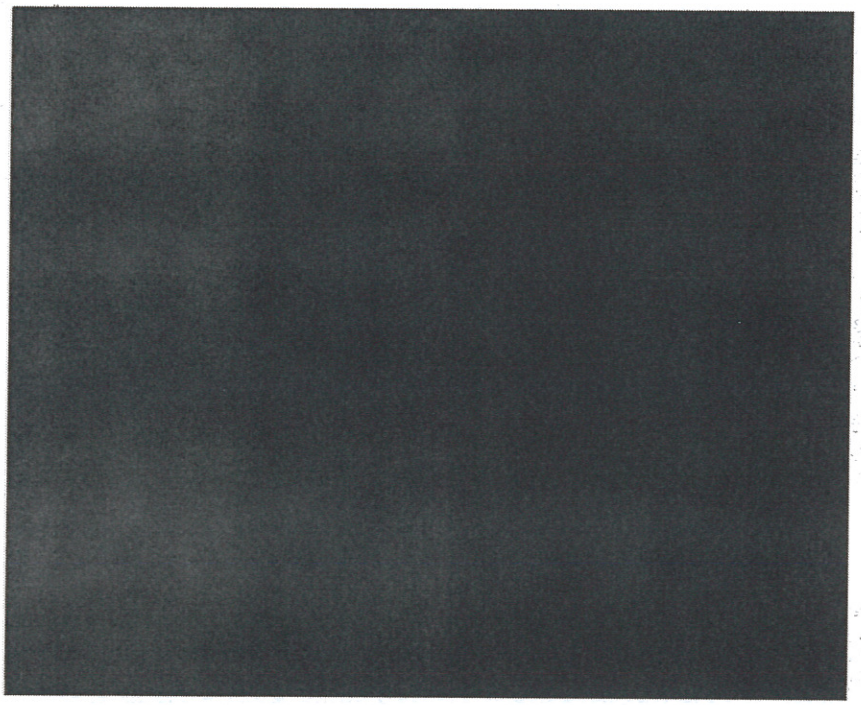
The two main areas of for the system are as follows;

(1) Weather Area - Drill Floor Drainage
(2) Weather Area - Deck Drains (weather area platforms and walkways inclusive)

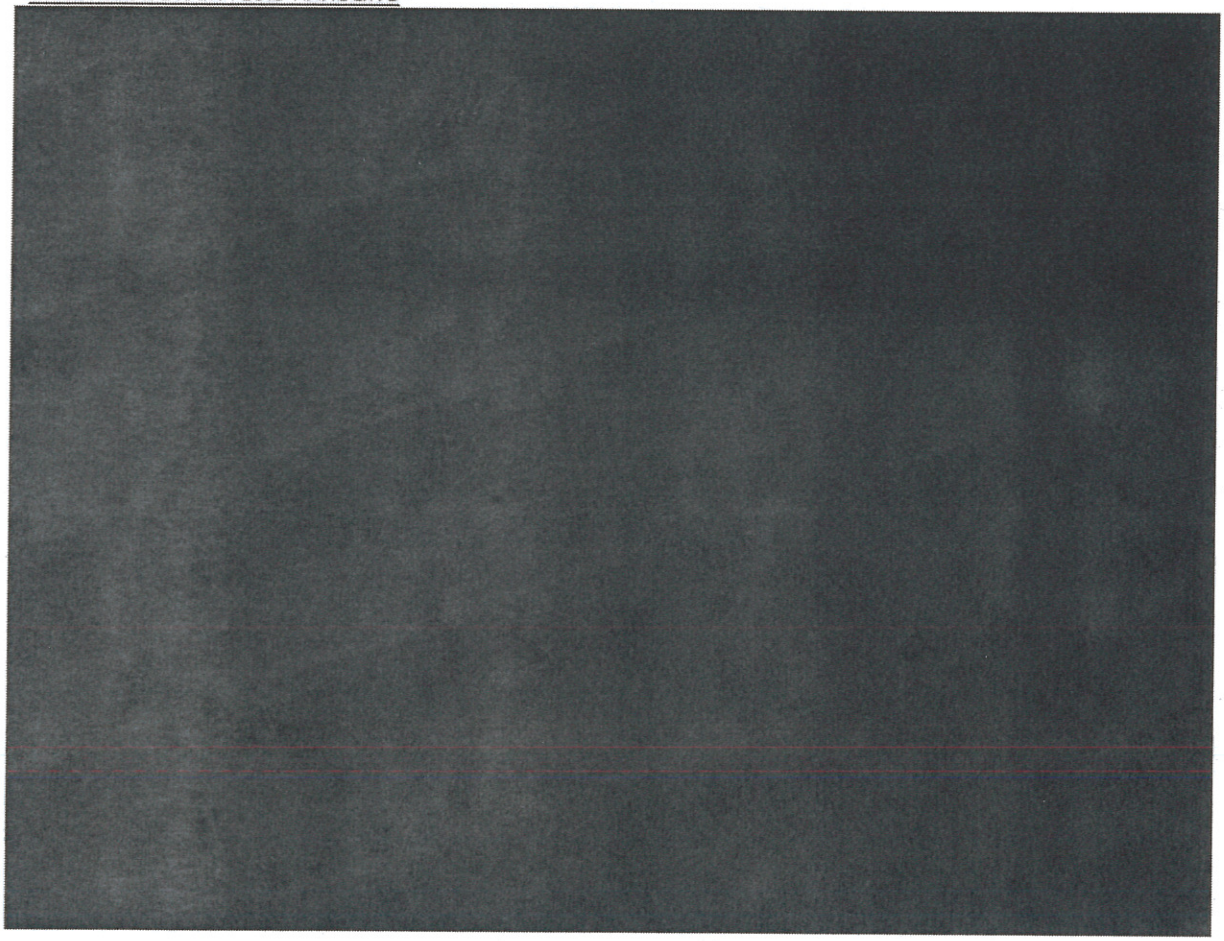
Additionally, there are drains in the Helideck area and Quarters area that are considered hydrocarbon free. These drains are routed overboard or to a separate collection tank. These drains will be monitored for sheen. Any sheen will be noted and reported as required.

KEY COMPONENTS

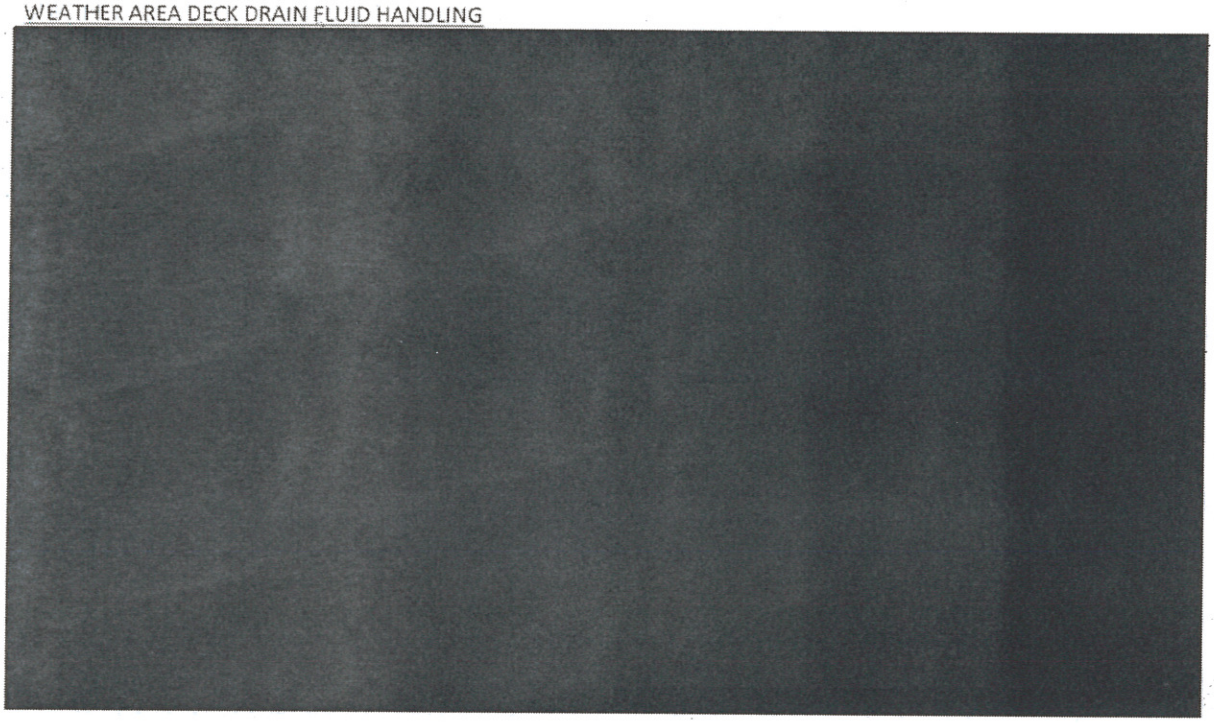
[redacted]



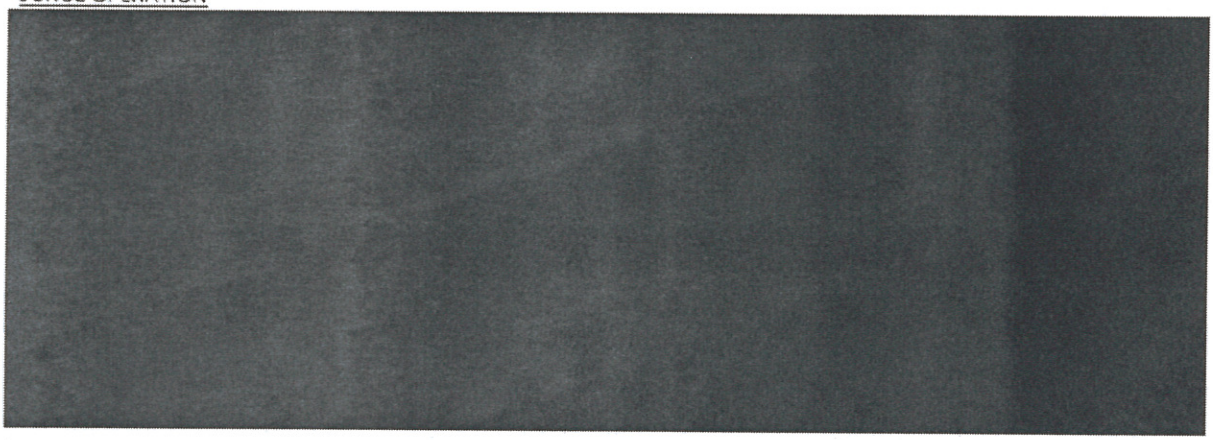
DRILL FLOOR DRAIN FLUID HANDLING



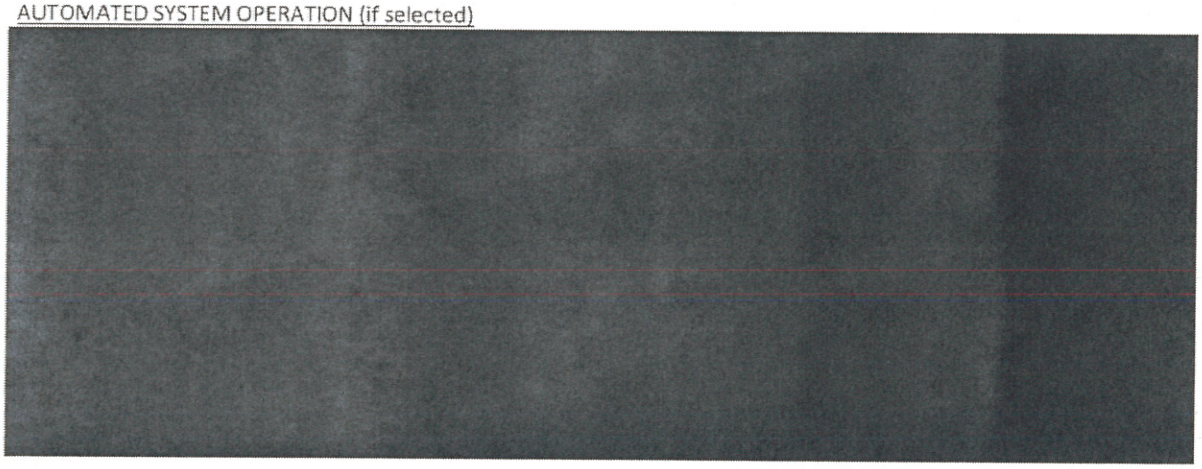
WEATHER AREA DECK DRAIN FLUID HANDLING



SURGE OPERATION



AUTOMATED SYSTEM OPERATION (if selected)



[redacted]

OWS Testing – [redacted]

[redacted]

ALARMS

[redacted]

COMPASS WATER SOLUTIONS

Service Call Report & Work Acknowledgement

Customer: Alexnder Ryan Marine & Safety	Vessel: Noble Discoverer
	P.O. #:
	Job #: 24726
	Date: 24-Jun-15
	Engineer: [redacted]

Model #:	[redacted]	Serial #:	[redacted]
Operation Hours:		Control Voltage:	230
Manufacture Date:	May-12	OCD Model #	[redacted]
OCD Calibration Date:	Ver 6th Mar2015	OCD Serial #	

On Arrival Condition:	Good	Fair	Poor
Overal	X		
Control Boxes	X		
Helisep	X		
OCD	X		
Paint		X	
Pumps	X		
Membranes	X		

Software: [redacted]

Software changed: [ ] Yes [X] No

New PLC:

New HMI:

Vessel Readiness

Operation and Service manual on hand?	Yes X	No
Is the Manual Language appropriate?	Yes X	No
Are the proper Technical service Bulletins available?	Yes X	No
Does the crew understand how to operate the unit?	Yes X	No
Does the crew understand how to clean the unit?	Yes X	No
Does the crew understand how to perform basic unit troubleshooting?	Yes X	No

Does the crew understand the following common environmental factors that affect operation of the unit:

- Salinity and temperature levels impacting the membranes?	Yes X	No
- Soot, Sand, Biological, and other fouling materials?	Yes X	No

What does the crew like or dislike regarding the equipment?
If they could speak with our design engineer, what would they like to see changed, added, or removed?

Service Call Report Work Acknowledgement

Service Report

24-Jun

1. Travel to Washington
2. I met with the Chief Engineer [redacted] We discussed my task.
3. I looked at the [redacted] because the Chief said the solenoids for Overboard and Recirculation were not operating. The power to the solenoids only had one leg of the 220 V power supply. The wires for the High Oil PPM Alarm and system shutdown were not hooked up.

25-Jun

1. I looked at the two units in the air compressor room. The wires for the High Oil PPM Alarm and shutdown were not hooked up.
2. We tried to operate the [redacted] on the Engine Room OWS and it could not handle the load of the Overboard and Recirculation Solenoid Valves. NAG installed a new monitor that did not work.
3. I reinstalled the [redacted] and Tested the system. It is operating correctly with good pressures. The Monitor is working correctly. It has a current Verification Certificate.

26-Jun

1. Today we wired the High Oil PPM Alarm wires on both of the air compressor room OWS's.
2. They were tested and the solenoids work and the High Oil PPM Alarms were working.

NOBLE DISCOVERER
MONROVIA
IMO : 8608608
GRT: 14051
NRT: 4216

Reported By:	Acknowledgem[redacted]
[redacted]	c/e [redacted]
CWS Service Technician	Customer Representative

Noble Drilling, Discoverer NAG Marine FSR 6-26-15

Fri, 06/26/2015 - 09:10 [redacted]
Service Job Reference: Service Job - Discoverer - Install & Commission qty 3 [redacted] - Noble

Service Info

Location: Everett, WA
Onsite Ship Rep: Chief E[redacted]
NAG Service Technican: [redacted]
Dates of Service: Thu, 06/25/2015 - Fri, 06/26/2015

Job Information

Customer PO Number: 4700392366
Job Number: 5509-000

Initial Tasking

Troubleshoot operation of Engine room OWS to [redacted] operation.

NAG Actions / Recommendations

The following was noted:

- Wiring to the common lead for high ppm alarm was terminated to the wrong 220vac input. Once corrected the unit functioned correctly for two solenoid cycles and then the relay board stoped working in the [redacted]

- Spare [redacted] was installed and tested unsatisfactory due to it erroring out when the alarm status changed from maintenance to normal operation. A power spike was observed that would either reset the [redacted] or lock it up and make it non functional. The solenoid valves were tested and replaced with the same results.

Recommend the following:

- Using isolated output to control the solenoid operation so not to disrupt the operation of the [redacted].
- Sending unit [redacted] to NAG Marine for troubleshooting and repair.

[redacted]
NAG Marine Services Manager
[redacted]

Signature: [redacted]

COMPASS WATER SOLUTIONS

Service Call Report & Work Acknowledgement

Customer:	Alexander Ryan Marine & Safety P.O. Box 9363 Houston, TX	Vessel:	Noble Discoverer
		P.O. #:	
		Job #:	24711
		Date:	May 17-21, 2015
		Engineer:	[redacted]

Model #:	[redacted]	Serial #:	[redacted]
Operation Hours:	236 h 12 min	Control Voltage:	230
Manufacture Date:	May-12	OCD Model #	[redacted]
OCD Calibration Date:	06-Mar-15	OCD Serial #	[redacted]

On Arrival Condition:	Good	Fair	Poor
Overal		x	
Control Boxes	x		
Helisep		x	
OCD	x		
Paint			x
Pumps		x	
Membranes			x

Software: [redacted]

Software changed: [ ] Yes [x] No

New PLC:

New HMI:

Vessel Readiness

Operation and Service manual on hand?	Yes x	No
Is the Manual Language appropriate?	Yes x	No
Are the proper Technical service Bulletins available?	Yes x	No
Does the crew understand how to operate the unit?	Yes x	No
Does the crew understand how to clean the unit?	Yes x	No
Does the crew understand how to perform basic troubleshooting of the unit?	Yes x	No

Does the crew understand the following common environmental factors that affect operation of the unit:

- Salinity and temperature levels impacting the membranes?	Yes x	No
- Soot, Sand, Biological, and other fouling materials?	Yes x	No
	Yes	No

What does the crew like or dislike regarding the equipment?
If they could speak with our design engineer, what would they like to see changed, added, or removed?

Reported By: [redacted]	Acknowledgement: [redacted] CE
CWS Service Technician	Customer Representative

NOBLE DISCOVERER
MONROVIA
IMo : 8608608
GRT: 14051
NRT: 4216
HP : 8690

Service Call Report & Work Acknowledgement

Customer: Alexander Ryan Marine & Safety P.O. Box 9363 Houston, TX	Vessel: Noble Discoverer P.O. #: Job #: 24711 Date: May 17-21, 2015 Engineer: [redacted]

Operational Pressures:

ON ARRIVAL

Heli-Sep			**Aqua-Sep**		
Heli-Sep Vacuum PI1:	7 (psi)	Hg	Seawater Supply Pressure		psi
Feed Pump Vacuum PI1	n/a	psi	Feed Pump outlet		psi
Process Filter			**MMF Filter**		
Process Filter Inlet PI2	51	psi	MMF Filter Inlet		psi
Process Filter Outlet PI2	46	psi	MMF Filter Outlet		psi
Process Filter Differential	5	psi	MMF Filter Differential		psi
Process Pump Discharge PI3	n/a	psi	Cartridge Filter Differential		psi
Spir-O-Lators			**Membranes**		
Spirolator Inlet PI4	n/a	psi	Inlet		psi
Spirolator Outlet PI4	n/a	psi	Outlet		psi
Spirolator Differential	n/a	psi	Differential		psi
Product Back Pressure PI5	40	psi	Product Output		
Product Outlet Pressure PI5	n/a	psi	Reject Output		
			Product TDS		

ON DEPARTURE

Heli-Sep			**Aqua-Sep**		
Heli-Sep Vacuum PI1:	3 (psi)	Hg	Seawater Supply Pressure		psi
Feed Pump Vacuum PI1	n/a	psi	Feed Pump outlet		psi
Process Filter			**MMF Filter**		
Process Filter Inlet PI2	42	psi	MMF Filter Inlet		psi
Process Filter Outlet PI2	32	psi	MMF Filter Outlet		psi
Process Filter Differential	10	psi	Filter Differential		psi
Process Pump Discharge PI3	n/a	psi	Cartridge Filter Differential		psi
Spir-O-Lators			**Membranes**		
Spirolator Inlet PI4	n/a	psi	Inlet		psi
Spirolator Outlet PI4	n/a	psi	Outlet		psi
Spirolator Differential	n/a	psi	Differential		psi
Product Back Pressure PI5	60	psi	Product Output		
Product Outlet Pressure PI5	n/a	psi	Reject Output		
			Product TDS		

GV Settings:	GV1	4	GV3	1.65	
Changed Y/N:	GV2	4	GV4	2.45	

Reported By:

[redacted]

CWS Service Technician

Acknowledgement:

[redacted]

Customer Representative

NOBLE DISCOVERER
MONROVIA
IMo : 6608608
4051
NRT: 4216
HP : 8690

Service Call Report Work Acknowledgement

Service Report

17-May

1. Travel to Everett.

18-May

1. Meeting with the crew to discuss the scope of the work.
2. OCD checked: verified in March 6th, 2015. The Verify Calib. Number was 0, all the detectors are OK. The OCD is in good condition.
3. High oil content ECR alarm checked. The Alarm 2 delay is 0 seconds now. The crew was not getting the alarm because they were pushing down the plunger while the system was stopped.
4. Overboard solenoid valve SV1 checked, it was clean.
5. Overboard - recirculation change tested, it works perfectly, the overboard valve does not leak. Delay set 5 seconds.
6. Motor valves tested, the 4 MV's work properly.
7. The cleaning tank had half an inch of sand at the bottom. I cleaned the tank but the seawater in the clean water supply is full of sand.
8. Cleaning timers adjusted. Chemical injection time reduced from 90 to 85 seconds. Circulation time extended from 1800 seconds to 2000 seconds.
9. System tested for 1 hour: The product backpressure (PI4) dropped 17 psi (from 57 to 40 psi). The other pressures were right and constant. The process filter differential pressure was 5 psi.
10. One hour automatic spir-o-lator flush tested, the system started again without an alarm and with normal pressures. The product backpressure only recovered 2 psi (42 psi).
11. The crew decided to replace the membranes. There was no room to take out the membranes, I had to disconnect high pressure inlet and outlet pipe, release the straps and push the housings to one side.
12. The membranes were very dirty. They were covered by oil sludge and the high pressure inlet and outlet side were fouled by sludge and debris.
13. Membrane housings cleaned.
14. The spare membranes were not new, they were an old set of membranes not in good shape. We decided to take 4 membranes from one of the 10000 systems.

19-May

1. Went to the ship. The plan then was to wait for a new set of membranes that are coming from CA.
2. Replaced the prefilters bag filters.
3. Replaced the process bag filter.
4. Bilge pump suction strainer cleaned.
5. On my way coming back to the hotel I had a call that the plan now is to take the membranes of one of the 10,000 systems.
6. We took out the membranes from the 10,000 system B.
7. Membranes installed in the 5,000 OWS with new o-rings in the interconnectors.
8. The pressure in the product outlet line was more then 100 psi and the ppm were out of range. The oily water is by-passing the membranes and going to the output water side.
9. We went again to the 10,000 system and took out another set of membranes to prove the ones in the 5,000 OWS are right installed.

Reported By:	Acknowledgement:
[redacted]	[redacted] CE
CWS Service Technician	Customer Representative

NOBLE DISCOVERER
MONROVIA
IMo : 6608608
GRT : 14051
NRT : 4216
HP : 8690

Service Call Report Work Acknowledgement

Service Report

10. I replaced the 2 housings end plates of the side without product water connections, using the plates of the 10,000 system. The ppm are out of range again and the pressure is high.
11. O-rings of the adaptor ports of the other 2 housing plates replaced. The same result.
12. We tried to install the new membranes, no problem with the two in the upper housing, which were installed in the flow direction (o-rings in the right position), but the lower housing membranes had to be installed backwards (wider side of the o-rings first) and there is no room to install them completely straight. Because of that I noticed the o-rings were not in the right position and we had to take them out again. The o-rings were broken.
13. We disconnected housings interconnection port and took the lower housing out of the system location.
14. Once the housing was out, I installed 2 new membranes (the o-rings of the other two were broken), and mounted one of the housing end plates using new adaptors and o-rings.
15. We put the complete housing with the membranes back to the unit and connected everything again.
16. The system was now with new membranes, new adaptors, new interconectors and o-rings.
17. We tried the OWS, when the overboard valve was open, the ppm were high (out of range) but when the overboard valve closed and the recirculation valve opened the ppm drop again below 15 ppm. The OWS was working in that cycle of high-low ppms.
18. I tested the OCD outlet looking for interruptions in the flow but it was constant.
19. We run the system again with the plunger down (recirculation) during a period of time. After that the ppm reading was 0.0 and it didn't get higher when the overboard valve opened.
20. We run the system for about 25 minutes, the differential pressure in the process filter was 12 psi. Chief Engineer decided to stop and replace the bag filter.
21. We run the system for other 10 minutes. The ppm reading was 0.0 all the time. We tried the overboard-recirculation change, it worked.
22. The backpressure droped 2 psi in that 25 minutes. The bilge water is contaminated with too much oil and sludge.

20-May

Stand-by in the hotel waiting for the Coast Guard inspection to be made.

21-May

1. The system passed the Coast Guard inspection.
2. 10,000 OWS membranes installed back in the system B with the old o-rings.
3. I made a list of spare o-rings needed.
4. We added a mixture of bleach (8.5% concentration) and cleaner to the cleaning tank and performed a cleaning cycle. In the circulation step, after ten minutes, we turned the power off and left the membranes into that mixture. If the system is not going to be used in more than two weeks, I would recommend to flush the OWS again [redacted] and perform the same process only with a gallon of bleach (no cleaner), and do the same after a month (if it is not used).

22-May

1. Travel to California.

Reported By:	Acknowledgement:
[redacted]	[redacted] CE
OWS Service Technician	Customer Representative

NOBLE DISCOVERER
MONROVIA
IMo : 6608608
~~CRT: 14054~~
NRT: 4216
~~HP : 8690~~

Service Call Report & Work Acknowledgement

Customer:	Alexander Ryan Marine & Safety P.O. Box 9363 Houston, TX	Vessel:	Noble Discoverer
		P.O. #:	
		Job #:	24711
		Date:	May 17-21, 2015
		Engineer:	[redacted]

Parts Used / Consumables

	Description	Qty
1	10 Microns Filter Bag [redacted]	2
2	5 Microns Filter Bag [redacted]	1
3	Bottle Brush [redacted]	1
4	Interconnector o-ring [redacted]	8
5	[redacted]	1
6		
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30		

Reported By:

[redacted]

CWS Service Technician

Acknowledgement:

[redacted] CE

Customer Representative

NOBLE DISCOVERER
MONROVIA
IMo : 6608608
GT : 14051
NRT : 4218
HP : 8590

Service Call Report Work Acknowledgement

Service Report

Recommendations:

1. The level of oil and sludge in the bilge water is excesive. I would recommend to reduce the timers of the [redacted] and [redacted] flush and perform cleaning cycles with a mixture of alkaline cleaner (part number [redacted] and bleach very often.

2. After each use of the OWS, an [redacted] flush and a couple of [redacted] flush should be performed. If the system is not going to be used for days I recommend to start a cleaning cycle with bleach and when it has been in the circulation step for about 10 minutes, turn off the power and leave the membranes in a mixture of clean water and bleach. That would prevent a biological contamination. Perform the same process once a month to renew the mixture.

3. The clean water used in the OWS (seawater) is full of sand. I would recommend either to supply fresh water to the system or filter that seawater.

4. I recommend too to install a 0-200 psi pressure gauge in the process pump discharge to have an idea of the differential pressure in the membranes and that the pump is working properly.

5. The list of spares I recommend to have always on hand is:

10 x	5 micron Filter Bag -
20 x	10 micron Filter Bag -
1 x	Filter Housing o-ring -
4 x	Membrane Element -
1 x	Oil Sensing Probe -
4 x	Adaptor seal -
4 x	Head Seal -
8 x	PWT Seal -
1 x	Oil Sensing Probe Relay -

[redacted]

Alkaline Cleaner [redacted]
Bleach.

Reported By:	Acknowledgement:
[redacted]	[redacted]
CWS Service Technician	Customer Representative

NOBLE DISCOVERER
MONROVIA
IMo : 6608608
GRT : 14051
NRT : 4219
HP : 8690

Service Call Report & Work Acknowledgement

Customer:	Alexander Ryan Marine & Safety P.O. Box 9363 Houston, TX	Vessel:	Noble Discoverer
		P.O. #:	
		Job #:	24711
		Date:	May 17-21, 2015
		Engineer:	[redacted]

Standard Daily Rate:
Up to 10 hours including travel

Overtime:
All time over 10 hours

Offshore Daily Rate:
Up to 10 hours

Overtime:
All time after 10 hours

Work hours

Date	Start Time	Stop Time	Rate Category	Straight Time to 10hrs	Overtime over 10hrs
17-May-15	12:00	22:00		10	
18-May-15	6:30	18:30		10	2
19-May-15	6:30	23:59		10	7.5
20-May-15	0:00	0:30			0.5
20-May-15	7:00	17:00		10	
21-May-15	6:30	16:30		10	
22-May-15	4:00	14:00		10	
			Total Hours:	60	0

Reported By:
[redacted]
CWS Service Technician

Acknowledgement:
[redacted]
Customer Representative

NOBLE DISCOVERER
MONROVIA
IMo : 6606608
GRT: 14051
NRT: 4216
HP : 8590

Service Call Report & Work Acknowledgement

Customer:	Alexander Ryan Marine & Safety P.O. Box 9363 Houston, TX	Vessel:	Noble Discoverer
		P.O. #:	
		Job #:	24711
		Date:	May 17-21, 2015
		Engineer:	[redacted]

Training:

Scope:

IMO Data downlcad procedures and data interpretation. Cleaning and long time preservation of the OWS. OCD Alarms explanation.

	Name	Title
1	[redacted]	1st Engineer
2		
3		
4		
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16		
17		
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21		
22		

Reported By:

[redacted]

CWS Service Technician

Acknowledgement:

[redacted]

Customer Representative

NOBLE DISCOVERER
MONROVIA
IMo : 6608608
GRT: 14051
NRT: 4216
HP : 8690

Service Call Report & Work Acknowledgement

Customer: Alexander Ryan Marine & Safety P.O. Box 9363 Houston, TX	Vessel: Noble Discoverer P.O. #: Job #: 24711 Date: May 17-21, 2015 Engineer: [redacted]

Service Acceptance Agreement

The purpose of this document is to ensure that both parties (Compass Water Solutions Inc. and the "Customer") are in agreement that the equipment serviced by Compass Water Solutions Inc. at the time of service is working properly.

This document constitutes acceptance of the equipment by the "Customer". Any and all outstanding issues as defined on the OIT (Outstanding Issues Tracking) sheet, if any, have been completed by the Service Engineer to the satisfaction of both parties

Outstanding Issues Tracking

		Sat	UnSat
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

Reported By: [redacted] CWS Service Technician	Acknowledgement: [redacted] CE Customer Representative

NOBLE DISCOVERER
MONROVIA
[illegible] 6000608
GRT: 14051
NRT: 4218
HP : 8690

MI-SWACO
A Schlumberger Company

14. Commissioning Procedures

MECHANICAL COMPLETION & INSTALLATION [redacted]

MODULE NO :

EQUIP. SER NO : [redacted]

MANUFACTURER :

SERVICE PURPOSE : RIG FLOOR DRAINS

TYPE : [redacted]

(REFER TO OPERATORS MANUAL)

MECHANICAL COMPLETION

		YES	NO
1)	Check all air, fluid and electrical connections, cables and lines for damage and ensure they are all properly fastened and safely aligned	✓	
2)	Verify unit is sitting on suitable deck for load when full (1.42 metric tons per m^3)	✓	
3)	Verify utilities are hooked up properly and well protected (air & water) and blow down hose before hooking up to system	✓	
4)	Verify the drain system is not hard piped to the MPC and that a small air gap (50 mm) is present INSPECTION HATCH PER DTEN		✓
5)	Set air pressure regulator up to 6.8 bar (100 psi) for 150gpm	✓	
6)	Test all air diaphragm pumps using the manual override	✓	
7)	Function test the DPLS switch by raising the floats to engage pump and the high-high red light using a stiff wire or rod to manipulate float handles	✓	
8)	Function test all high level (2) and all low level (2) switches	✓	
9)	Verify contingency options for worse-case scenarios	✓	
10)	Review termination points and hose-routes for all 3 x waste streams	✓	
11)	If dense phase will be monitored, the use of the stroke counter is necessary. Function test this retro-fit sub-system and reset counter (2.99 lps)	N/A	✓
12)	Verify an inline cleanout/strainer is in place in drains systems upstream of the MPC	✓	
13)	NOTE: This document is to be filled out ONLY AFTER the rig survey and the following have been reviewed, understood and discussed with the Location-Client Representative: • Rig up check list • Start up procedures	✓	

REMARKS DIW MONITOR INTEGRATED INTO THE SYSTEM

MI-SWACO COMMISSIONING ENGINEER: [redacted]

SIGN : [redacted] DATE : 20/10/14

DSM/CLIENT REP: [redacted]

SIGN

MI SWACO
A Schlumberger Company

ONBOARD TRAINING COMPLETION CHECK LIST [redacted]

MODULE NO :

EQUIP. SER NO : [redacted]

MANUFACTURE:

SERVICE PURPOSE : Rig Floor Drains

TRAINING

		YES	NO
1	Once the [redacted] has been determined to be ready for operations, it is advised to give a 15 minutes basic presentation of the [redacted] to the rig crew during the weekly safety meeting. If not available for the meeting then a hands on walk-through with the DSM, OIM, Barge Master & Mud Engineer are required, describing basic operations	✓	
2	Discuss with the OIM which 2 x rig personnel (opposite shifts) will be responsible for the [redacted] operation. This man needs trained extensively in the principles/design/expectations/trouble shooting of the [redacted]	✓	
3 *	Make sure the Mud Engineer is aware of the DP hose that is routed back to his active system (suggested route is over any shaker screen)		✓
4 *	Make sure the DSM & the Mud Engineer know that the DP sub-system will be returning previously thrown away whole mud back to their active system (avg 1.31 bbl/day but certain periods/events can far exceed this number)		✓
5	Review and discuss [redacted] Operations manual	✓	

* NO MUD ENGINEER ONBOARD

MI-SWACO COMMISSIONING ENGINEER:		DSM/CLIENT REP:	
SIGN : [redacted]	DATE : 20/10/14	SIGN :	DATE :

MI SWACO
A Schlumberger Company

PROJECT: NOBLE DISCOVERER	DESCRIPTION:	LOCATION: SINGAPORE
CONTRACT:	CLIENT:	DATE: 20/10/14
SYSTEM NO:	REVISION:	
SYSTEM DESCRIPTION: MPC FOR DRILL FLOOR DRAINS		

PROJECT VERIFICATION	YES	NO
PIPING COMPLETION	✓	
INSTALLATION COMPLETION	✓	
MECHANICAL COMPLETION	✓	
ELECTRICAL COMPLETION	✓	
COMMISSIONING ACCEPTANCE	✓	

INSTALLATION & COMMISSIONING CLIENT ACCEPTANCE

M-I SWACO REPRESENTITIVE.	CLIENT REPRESENTITIVE.
DATE: 30/10/14	DATE:
NAME [redacted]	NAME: [redacted]

PROJECT:	DESCRIPTION:	LOCATION:
CONTRACT:	CLIENT:	DATE:
SYSTEM NO:	REVISION:	
SYSTEM DESCRIPTION:		

PROJECT VERIFICATION	YES	NO

Service Job - Discoverer - Install & Commission qty 3 [redacted]

Mon, 06/15/2015 - 09:48 — [redacted]
Service Job Reference: Service Job - Discoverer - Install & Commission qty 3 [redacted] - Noble

Service Info

Location: Seattle Wa
Onsite Ship Rep: [redacted]
NAG Service Technican: [redacted]
Dates of Service: Tue, 06/09/2015 - Fri, 06/12/2015

Job Information

Customer PO Number: 4700392366
Job Number: 5509-000

Initial Tasking

Install & Commission qty 3 [redacted]

NAG Actions / Recommendations

Installed [redacted] to [redacted] disconnected existing OCM, associated wiring, disconnected and blanked off water wash piping, installed new brackets to mount [redacted] Connected [redacted] to OWS controll cabinet using new Quick Disconnects/Cable. Performed operation test as per [redacted] Inspection and Commisioning Procrdures. Product flow was within standards, 1 gal per min, High PPM alarm sounded and overboard valve cycled to recirc position when maintaince handle was operated. Conducted training with crewmembers on operation and cleaning of [redacted] OCM

Installed [redacted] to [redacted] disconnected existing OCM, associated wiring, disconnected and blanked off water wash piping, installed new brackets to mount [redacted] Connected [redacted] to OWS controll cabinet using existing cabling. Performed operation test as per [redacted] Inspection and Commisioning Procrdures. Product flow was within standards, 1 gal per min, High PPM alarm sounded and overboard valve cycled to recirc position when maintaince handle was operated. Conducted training with crewmembers on operation and cleaning of [redacted] OCM

Installed [redacted] to [redacted] disconnected existing OCM, associated wiring, disconnected and blanked off water wash piping, installed new brackets to mount [redacted] Connected [redacted] to OWS controll cabinet using existing cabling. Performed operation test as per [redacted] Inspection and Commisioning Procrdures. Product flow was within standards, 1 gal per min, High PPM alarm sounded and overboard valve cycled to recirc position when maintaince handle was operated. Conducted training with crewmembers on operation and cleaning of [redacted] OCM

Signature: [redacted] 6-15-15

NAG MARINE

[redacted] Inspection

Rev. 1.0–
06 Feb 2012

Ship: Noble Discoverer Location: SEATTLE WA Date: 6-11-15

OWS s/n: NAG Marine Service Engineer [redacted] Ship's Force Representative [redacted]

OCM s/n: [redacted]

Software	Readings	Corrective Action / Notes
Date and Time Set to GMT	(Yes) / No	
Verify maintenance mode activation	(Sat) / UnSat	
Relay Operation Check	(Sat) / UnSat	
Backup Battery Voltage	VDC	
Data Download Test	(Sat) / UnSat	
Last Calibration Date	2-20-15	
Note: Calibration is good for Two (2) years from commissioning but not to exceed (36) months from manufactured date.		

Preventative Maintenance	Readings	Corrective Action / Notes
Check Desiccant Plug	(Sat) / UnSat	
Clean cell [redacted] Operations Manual (9.2.2)	Sat / UnSat	
Check calibration [redacted] Operations Manual (9.2.3) Solution PPM: 30	PPM	
Note:		

Clean Water Check	Readings	
RAW	.02	
FS %	.017	%
FL	.023	V
REF	1.122	V
REFCAL	1.179	V
PPM	0	PPM
Cell %	100	%
Max Temp	22.5	°C
High Std	8.486	
Low Std	0.015	
Note:		

Corrective Action / Notes

Ref: Service Manual (4.0-4.4) Operations Manual (9.0-9.1, 9.2-9.2.3)

Signatures:

Technician [redacted] Ship Representative: C/E [redacted]

[redacted] Inspection

Rev. 1.0–
06 Feb 2012

Ship: Nobu Discover Location: Seattle WA Date: 6-12-15

OWS s/n: NAG Marine Service Engineer Ship's Force Representative

OCM s/n: [redacted] [redacted] [redacted]

Software	Readings	Corrective Action / Notes
Date and Time Set to GMT	(Yes) / No	CALIBRATION DATE GOOD FOR 2 YEARS FROM COMMISIONING DATE
Verify maintenance mode activation	(Sat) / UnSat	
Relay Operation Check	(Sat) / UnSat	
Backup Battery Voltage	VDC	
Data Download Test	(Sat) / UnSat	
Last Calibration Date	2-20-15	
Note: Calibration is good for Two (2) years from commissioning but not to exceed (36) months from manufactured date.		

Preventative Maintenance	Readings	Corrective Action / Notes
Check Desiccant Plug	(Sat) / UnSat	
Clean cell [redacted] Operations Manual (9.2.2)	(Sat) / UnSat	
Check calibration [redacted] Operations Manual (9.2.3) Solution PPM: 30	27.2 PPM	
Note:		

Clean Water Check	Readings	Corrective Action / Notes
RAW	.06	
FS %	.052 %	
FL	.064 V	
REF	1.151 V	
REFCAL	1.136 V	
PPM	0 PPM	
Cell %	100 %	
Max Temp	21.6 °C	
High Std	8.238	
Low Std	~~0.1~~ 0.016	
Note:		

Ref: Service Manual (4.0-4.4) Operations Manual (9.0-9.1, 9.2-9.2.3)

Signatures:

Technician: [redacted] Ship Representative: [redacted]

NAG MARINE

[redacted] Inspection

Rev. 1.0–
06 Feb 2012

Ship: Noble Discoverer Location: South WA Date: 6-12-15

OWS s/n: NAG Marine Service Engineer Ship's Force Representative

OCM s/n: [redacted] [redacted] [redacted]

Software	Readings	Corrective Action / Notes
Date and Time Set to GMT	(Yes) / No	
Verify maintenance mode activation	(Sat) / UnSat	
Relay Operation Check	(Sat) / UnSat	
Backup Battery Voltage	VDC	
Data Download Test	(Sat) / UnSat	
Last Calibration Date	2-20-15	
Note: Calibration is good for Two (2) years from commissioning but not to exceed (36) months from manufactured date.		

Preventative Maintenance	Readings	Corrective Action / Notes
Check Desiccant Plug	(Sat) / UnSat	
Clean cell [redacted] Operations Manual (9.2.2)	(Sat) / UnSat	
Check calibration [redacted] Operations Manual (9.2.3) Solution PPM: 30	25.5 PPM	
Note:		

Clean Water Check	Readings	Corrective Action / Notes
RAW	.14	
FS %	.125 %	
FL Crow160	.157 V	
REF	1.077 V	
REFCAL	1.050 V	
PPM	.2 PPM	
Cell %	100 %	
Max Temp	23.3 °C	
High Std	6.947	
Low Std	0.024	
Note:		

Ref: Service Manual (4.0-4.4) Operations Manual (9.0-9.1, 9.2-9.2.3)

Signatures:

Technician [redacted] Ship Representative [redacted]

Approved

Approval Date: 06/11/2015 13:06

Approved By: [redacted]

WIM Report:

OILY WATER SEPARATOR- OPERATION- ENGINE ROOM

NDI-WIM-ENG-0001

NDOR Codes: 0

Report Generated: 06/11/2015

Title: OILY WATER SEPARATOR- OPERATION- ENGINE ROOM

Rig: Discoverer

Operator: Shell Alaska

Location: Ocean Transit -Malaysia to US

Required Personnel:

Position	Quantity	Position	Quantity
Engineer	1		

Required Permits:

Cold Work

Required Tools and Equipment:

Name	Quantity	Name	Quantity
Oil Record book	1		

Preparations:

Step	Note
1	Conduct a pre-job safety meeting and review JSA with all crew members involved. • Review the procedure and the JSA. • Assign responsibilities as to the controls required on the JSA (Noted on the JSA) • Ensure crew members understand their duties and responsibilities.
2	Make sure crew members are clearly informed on the expectations like: • Follow policies • No short cuts • Wear the proper PPE • Make sure crew members are aware of their obligation to inform supervisor when something does not go or look right and to Stop the Job for the same reasons.
3	Bilge water holding tank and waste oil tank need to be sounded
4	FAILURE TO COMPLY WITH THIS PROCEDURE OR ANY ATTEMPT TO BYPASS THE OILY WATER SEPARATOR CAN RESULT IN TERMINATION, FINES AND POSSIBLE IMPRISONMENT!!! THIS INCLUDES JUMPING OUT OR TRICKING SENSORS AND HOT-WIRING SOLENOID VALVES OR PUMPS. ONLY QUALIFIED ENGINEERS ARE TO OPERATE THE OILY WATER SEPARATOR.

Procedures:

Step	Note
1	Ensure that the following valves are closed: o Drain valves on all vessels o Bilge oily water feed valve o Overboard discharge valve o Oil test cock o Oil dump valve
2	Ensure that the following valves are open: o Clean water inlet valve open o Return to Bilge Service Valve o Waste oil tank valve
3	Prime the pump with clean sea water.
4	Start the system using clean sea water. The system must be filled with clean sea water or the clean areas of the system will be contaminated with oily water.
5	When water comes out of the sampling valve in the second vessel the two stages have been filled.
6	Ensure that the system is running at 20 psi. If not adjust the pressure relief / water valve.
7	Check to see that the power is on to the monitor.
8	Close the clean water inlet valve to and open the bilge oily water inlet valve and valve to bilge water holding tank.
9	If the pressure exceeds 40 psi then replace the coalescer cartridge and media in the second stage.
10	Weekly Check the operation of the first stage oil discharge valve, by pressing the manual relay test (override) button in the oil discharge control probe head. If valve fails to operate do not use the unit until the problem has been fixed. Check the gland packing stuffing box on the separator feed pump and adjust as necessary to avoid air priming. Replace packing when stuffing box contacts the gland housing.
11	Every Six Months Check the operation of the pressure relief valve by partially closing the overboard discharge. Clean the air eliminator.
12	Annually Drain both stages and remove top covers and all valves. Thoroughly wash through the separator vessels using hot water and clean all valves. Reassemble with new coalescer cartridges and joints installed. Reset pressure relief / water valve.
13	Three to Five Years All of the above and remove and replace first stage coalescer pack.

No Data:

Approved

Approval Date: 07/14/2015 18:14

Approved By: [redacted]

WM Report: [redacted] START- UP AND CONTINUOS OPERATION

NDI-WIM-MNE-0055

NDOR Codes: 0

Report Generated: 07/14/2015

Title: [redacted] START-UP AND CONTINUOS OPERATION

Rig: Discoverer

Operator: Shell Alaska

Location: Seattle - WA

Required Personnel:

Position	Quantity	Position	Quantity
Chief Mate	1	Mate	1
Driller	1		

Required Tools and Equipment:

Name	Quantity	Name	Quantity
Multi Phase Clarifier (slef contained equipment)	1	OWS #1	1
OWS #2	1		

Preparations:

Step	Note
1	Reference [redacted] manual [redacted] on share drive path [redacted]
2	Reference Envirotech Oil in Water / Oil Content Meter manual "file path unknown"
3	Check the following tank levels in system to establish reference level prior to processing deck drainage: [redacted]
4	Check pre[redacted] strainer alignment and condition. There are two conical strainers and housings. The fwd strainer is the primary strainer unit. Check valve lineup to ensure deck drain water passes through primary strainer. The aft strainer unit is the secondary unit and should only be used when cleaning the primary unit. This configuration must be followed due to physical placement of strainers - in order to clean the aft / secondary strainer, the fwd / primary strainer must be taken offline and disassembled. This prevents the processing of any deck drainage while both strainers are disassembled. Fwd strainer is primary unit, and when it needs cleaning, aft secondary strainer is brought online for brief period of time to allow cleaning of primary. Note: clogged strainer may cause deck drain system to back up and allow deck drain water to flow backward, up through shaker house overhead drains and onto centrifuge and transfer decks.
5	Check the following flow path and valve alignments into the [redacted] to ensure system functionality: [redacted] Check the following flow path and valve alignments on the backside of the [redacted] to ensure system functionality: [redacted] Also check air supply valves to [redacted] water, free oil, solid pump, and ship pump room deck drain holding tank transfer pumps.
6	Check [redacted] monitoring system. Verify three way valve [redacted] and OIWS / OCM operation. Verify failsafe closed operation of three way valve [redacted] Verify that the local indicator panel and remote bridge indicator panel correctly indicates the three way valve [redacted] position when discharging to OWS and overboard.
7	Test high level alarms for [redacted] sludge tank. Alarm should sound locally with a blue visual flashing light and audible siren, and after an approximately 10 second delay, a second alarm should activate on the [redacted] system in the generator control room.

Preparations:

Step	Note
8	Reference P2R Fluid Transfer Procedure and Fluid Transfer checklist, located at file path [redacted]

Procedures:

Step	Note
1	Ensure JSA, WIM, and Fluid Transfer Checklist are in place for start up and continuous operation of [redacted]. Notify ECC prior to starting system or any overboard discharge. A new JSA, WIM, and Fluid Transfer Checklist shall be completed once per tour, at a minimum of twice per 24 hour period while [redacted]s in continuous operation. The Chief Mate will be PIC for operation, and may delegate oversight of operation to the watch officer mate. Driller shall coordinate with watch officer mate to ensure proper lineup of LP mud system distribution box and to ensure rig floor deck drains remain free of trash and excessive mud, hydrocarbons, oil/water emulsions, and free oils.
2	[redacted] System Operation Overview: The [redacted] processes Drill Floor area drains into three streams: [redacted] it is assumed drainage from these areas does not contain drilling fluids. These fluids can be sent to the [redacted] for processing via transfer pump, although they can also be sent to the deck drain system oily water separators independently. Drainage transferred to the [redacted] passes through a system of weirs, where particulates precipitate out to the [redacted] solids collection chamber, free oils rise and are collected in the [redacted] free oil collection chamber, and water collects in the [redacted] water collection chamber. A system of three pumps, activated on/off through high/low limit switches within the free oil, solids, and water [redacted] collection chambers, transfer water, free oil, and solids to final collection points. Water is pumped through the oil in water sensor / oil content meter measuring point, and overboard if oil content measures less than 15PPM, or to the deck drain OWS units if oil content is measured greater than 15PPM. Solids are pumped to the LP Mud System Distribution Box for re-integration into mud system, and free oils are pumped to the [redacted] sludge tank.
3	Select manual operation in order to function test the [redacted] water pump, [redacted] free oil pump, [redacted] solid pump, [redacted] Once pumps are verified as operational, select automatic operation by selecting "solenoid" on pump selector switches for [redacted] and "auto" for holding tank transfer pumps.
4	With [redacted] in automatic operating mode, monitor discharge of clean water, solids, and sludge. Monitor [redacted] transfer pumps. Monitor following tank levels: surge tank, sludge tank [redacted] and overflow tank.
5	Monitor three way valve [redacted] indicator panel to determine if clean water from [redacted] discharge has an oil content of greater than 15PPM and is being directed to OWS units, or if clean water from [redacted] discharge has an oil content less than 15PPM and is being discharged overboard.
6	Clean [redacted] pre-strainers as required by operational conditions. Change strainer lineup to isolate primary (fwd strainer) and bring secondary (aft) strainer online. Remove primary strainer from basket, clean, return to service condition, and change strainer lineup to primary online, secondary secured.

No Data:

Approved

Approval Date: 07/13/2015 21:01

Approved By: [redacted]

WIM Report: Operation of Deck Drainage OWS units

NDI-WIM-MNE-0056

NDOR Codes: 0

Report Generated: 07/14/2015

Title: Operation of Deck Drainage OWS units

Rig: Discoverer

Operator: Shell Alaska

Location: Seattle - WA

Required Personnel:

Position	Quantity	Position	Quantity
Chief Mate	1	Mate	1

Required Tools and Equipment:

Name	Quantity	Name	Quantity
OWS #1	1	OWS #2	1

Preparations:

Step	Note
1	Ensure JSA, WIM, and Fluids Transfer Checklist are in place prior to startup. Notify M-I SWACO Compliance prior to operating the system for sampling requirements according to NPDES permit number AKG-28-8100.
2	Check existing fluid levels in [redacted] and head pressure in Feed Line (located adjacent to OWS units) for reference prior to processing.
3	Reference P2R Fluid Transfer Procedure and Fluid Transfer checklist, located at file path: [redacted]

Procedures:

Step	Note
1	Reference OWS manual [redacted] on share drive path [redacted]
2	Ensure the following valves are OPEN: (See Appendix C for the location of referenced valves) a. Process Filter Vent Valve [redacted] b. Processed Water Sample Valve [redacted]
3	Ensure the following valves are CLOSED: (See Appendix C for the location of referenced valves) a. [redacted]ilter Drain Valve [redacted] b. [redacted] Drain Valve [redacted] c. [redacted]Vent Valve [redacted] d. [redacted]OD Sample to Drain [redacted] e. [redacted]Outlet/Feed Pump Discharge Sample Valve [redacted] f. [redacted]Feed Sample Valve [redacted]
4	Return to ship's Pump Room, line up valves between [redacted] tanks, and turn on Feed Pump to supply head pressure to OWS Feed Line.
5	After Pre-Start checks are performed and the Initial Start-Up has been completed (See manual referenced above)
6	Go through the following routine startup procedure (Section 4.5.1 of Operation Instructions) a. Place Power Switch into the ON position b. Reset alarms if necessary. c. Press the START pushbutton to begin processing d. Once processing is completed, press the STOP pushbutton i. If [redacted] has been running for more than 45 minutes, it will perform an automatic [redacted] flush at the time it is shut down.

No Data.

Noble Discoverer

LIQUID TRANSFER

All liquid transfers from the rig/ship to supply vessel will be managed by following the facility specific Fuel Oil Transfer Procedure.

Because of the sensitivity of these transfers, a certified fuel hose will be used and will be replaced on an annual basis as a more efficient alternative of the required re-hydro date requirements currently set up for fuel hoses.

SAMPLING

All sampling will require a sampling access point for each discharge to ensure accurate sampling of pH levels as well as any other parameters dictated by the NPDES General Permit AKG 28-8100. Addendum

DISCHARGES

Discharge 001: Drilling Fluids & Cuttings

During the drilling of the tophole, muds and cuttings will be discharged and deposited at the seafloor.

After the tophole is completed, drilling is advanced through the BOP stack and marine riser. Water-based drilling fluids and drill-cuttings are transported up the riser to the drilling unit. There the drill-cuttings are separated from the water-based drilling fluids by solids control equipment.

Noble Discoverer

The separated solids (drill-cuttings) are discharged into the sea and the reclaimed water-based drilling fluid is used to continue the drilling process.

After prolonged drilling, the water-based drilling fluid properties degrade through exposure to temperatures and pressures in the well and by dilution with water and clay-sized cuttings particles. At that point, a portion of the water-based drilling fluid may be discharged to allow for water-based drilling fluid reformulation. At the end of the drilling operations, water-based drilling fluids may be discharged in bulk.

Discharge 002: Deck Drainage

Deck drainage is the wastewater associated with washing platforms, decks, and equipment, and runoff from curbs, gutters, pans and wash areas from the deck of the drillship or drilling rig. Permit No.: AKG-28-8100 requires deck drainage systems to separate drains associated with oil and grease wastewater from wastewater not in contact with surfaces containing any oil or grease. The wastewater associated with oil and grease drains is processed through an oil-water separator prior to discharge into the Chukchi Sea. The effluent discharged through the oil-water separator will be tested four times during the drilling of the well using the initial toxicity testing screening method described in the QAPP. The salinity of the discharge will be measured and, if necessary, adjusted with brine solutions or artificial sea salts to testing conditions suitable for marine organisms.

Discharge 003: Sanitary Wastes

Sanitary waster is captured and processed by Marine Sanitation Device (MSD) effluent is discharged overboard or bunkered for storage. MSD will be inspected by a third party competent person annually with valid certificate of inspection retained by Person In Charge (PIC).

Discharge 004: Domestic Waste

Domestic waste is normally discharged overboard under MARPOL regulations. We have the option to bunker domestic waste when more stringent regulations apply. Fluids can be diverted through MSD and into holding tanks.

Discharge 005: Desalination

Effluent discharges associated with the creation of fresh water from seawater are likely to be high concentration brines similar to seawater in chemical composition but with higher concentrations of anions and cations. The potential high saline conditions of this discharge type may require a reduction of salinity to conditions that are conducive to the tolerant range of test organisms for both initial toxicity testing screen and the WET test

Discharge 006: Blowout Preventer Fluid (BOP)

BOP fluid is a mixture made by an automated process onboard the *Noble Discoverer* following manufacturer's recommendation of approximately 60% water, 38% glycol and 2% Erifon HD603HP. Noble is responsible for monitoring and recording tank volumes involved in the process of mixing BOP fluid. Visual inspection of the receiving water, near the location of the BOP will be completed during each test. Function test volumes and observations will be recorded.

Noble Discoverer

Discharge 007: Boiler Blowdown

The materials inside the boiler drums, including water and solids, are discharged periodically to minimize solids buildup in the boiler units. It is likely this discharge will be fresh water and contain some amount of solid materials. If necessary, the fresh water will be adjusted with brine solutions or artificial sea salts to salinity conditions conducive to test organism survival using the guidance provided in the EPA-approved methods for both initial toxicity testing screen and the WET test.

Discharge 008: Fire Control System Test Water

This discharge is created from seawater released during fire training exercises, and testing and maintenance of fire protection equipment. If necessary, the salinity of the fire control system test water will be adjusted to within testing parameters prior to the addition of test organisms. If water lands on deck, it must be captured within deck drainage system.

Discharge 009: Non-contact Cooling Water

Non-contact cooling water is uncontaminated, heated seawater created when cold seawater is used to cool machinery on the drill rig. It represents the highest volume of discharge authorized under Permit No.: AKG-28-8100. If necessary, the salinity of the non-contact cooling water will be adjusted to within testing parameters prior to the addition of test organisms.

Discharge 010: Uncontaminated Ballast Water

Will not be discharged at all while on location. During operations, equipment and supplies will be loaded, unloaded or moved around the vessel, which changes the overall stability of the vessel. In order to maintain safe operating conditions and to ensure proper stability of the vessel, seawater is constantly moved in and out of ballast tanks that are located throughout the entire vessel.

Discharge 011: Bilge Water

Bilge water drains into the drilling vessel hull and is processed through an oil-water separator. Aquatic organisms may exist in the bilge water discharge. Samples will be visually inspected using a light table to determine if organisms are present in the effluent. If organisms are observed, the effluent will be passed through a Nytex™ screen large enough to capture the organisms prior to the start of any testing.

Discharge 012: Excess Cement Slurry

Will conduct a visual observation of the discharge during daylight hours. If discharge occurs during low light or low visibility, a static sheen test will be performed. Halliburton Cement Operator will provide the total chemical and cement volumes to compliance to be recorded.

Discharge 013: Muds, Cuttings, and Cement at the Seafloor

During the drilling of the tophole, muds and cuttings will be discharged and deposited at the seafloor. During cementing of casing strings, muds and cement from the tophole portion will be deposited on the seafloor and/or on the bottom of the MLC.

Noble Discoverer

RECORDKEEPING

The documentation required within this manual will be located with PIC and / or designee. Sampling logs for each applicable discharge, equipment certifications, and SDS for all chemicals added to equipment associated with the discharge stream.

ADDITIONAL INFORMATION

NEPDES permit # AKG-28-8100

Burger V_NOI

Discharge Specific Local Work Instructions

Quality Assurance Project Plan (QAPP)

Best Management Plan (BMP)

Annual precipitation: Based on National Data for Weather and Buoy Center

RIG: Noble Discoverer
Drilling Floor Drains

By: [redacted]
Check by: [redacted]
Date 10/3/12013

Subject: Alaska Precipitation Northern/western Coastal region of Alaska and Outer continental shelf, Chukchi Sea

Area in reference:
Barter Island
Barrow lat. 71.29, long. -156.78
Colville lat. 70.23, long -151.63
Wainwright lat. 70.63, long. -160.03
Prudhoe Bay lat. 70.25, long.-148.33
Point Hope lat. 68.34, long -166.80 see table 1 for precipitation
Point lay lat. 69.09, long -163.62 see table 1 for Precipitation

ALASKA NORTHERN COASTAL REGION CHUKCHI SEA

Precipitation, unit inches

Selected Weather station	Period	Highest daily total		Highest yearly total	
		date	amount	Year	amount
Barter, AK	1949-1988	Jan-62	2.25	1954	15.8
		Sep-54	2.4	1962	9.79
		Oct-71	1.64	1967	9.53
Prudhoe Bay, AK	1968-1999	Jan-97	0.6	1989	1.79
		Jun-87	0.56	1996	1.68
		Feb-89	0.42	1991	1.58
Borrow, AK	1915-2013	Jul-87	1.28	1963	9.61
		Jul-89	1.03	1925	7.16
		Oct-26	1	1989	7.07
Colville, AK	1996-2013	Jul-02	0.71	2011	4.48
		Jul-00	0.65	2000	4.37
Wainwright, AK	1942-2013	Aug-05	0.74	N/A	N/A
		Aug-09	0.61	N/A	N/A
		Jun-05	0.57	N/A	N/A

The table indicates the worst Rainfall in one day (24 HR) and the highest in one year between those periods.

Discoverer drill floor anticipating rainfall per hour

- Used the Highest total individual day 2.25 inches recorded in 1965
- Yearly rainfall not used
- [redacted]

Using the highest recorded **2.25 inches** of rainfall in a period of 24 hr. = .093 inches per hour. Using a safely factor of 4 = .375 inches of rainfall will be used for the proposes of sizing a holding tank

767.6 GPH =

12.7 gpm

[redacted]

Summary:

Northern west coastal region of Alaska is an arid area. The coastal area including offshore annual average total precipitation is 6.7 inches, which was recorded for a period of 14 yrs. Most of the rain falls between June and October., with August being the rainiest month at 1.14 inches.
It would be safe to say that 0.375 in per/hr of rainfall would be the worst case for any accumulation of rain falling on the drilling deck of the Drilling Rig Discoverer.

This analysis encompasses the northern and western shoreline of Alaska coastal region from Prudhoe Bay to Point Hope and outward 300 nautical mile of Outer continental shelf.

Reference to: Chukchi Sea Planning Area : oil and gas lease sale 193 in the Chukchi Sea

Table 1

Community Climate Data

Community	Temperature Range	Average annual Precipitation	Normal annual Snow Cover
Point Hope	-49 to 78 ºF	10 inches	36 inches
Point Lay	-55 to 78 ºF	6.9 inches	21 inches
Wainwright	-56 to 80 ºF	5 inches	12 inches
Barrow	-56 to 80 ºF	5 inches	20 inches

Sources:

- **Alaska Department of Commerce, Community Online Database.**
- **Environmental Impact statement OCS EIS/EA MMA 2006 -.060.**
- **U.S. Department of the Interior Minerals Management Service, Alaska OCS Region.**
- **Temperature Anomalies and Features of Weather in Russia and in the Northern Hemisphere in 2012.**